July 23, 1953

[redacted]

Subject: Project L

25X1A2g

This report covers the (7) foreign bearings, submitted with your memo of July 8th under the above subject.

All bearings are identified as follows:

1. 936a - Single row, open type bearing with riveted steel ribbon ball retainer, marked - "Made in Italy - C26-69-3C-RIV".

2. 936b - Single row, open type bearing with riveted steel ribbon ball retainer, marked - "4 3-5 -405".

3. 936c - Single row, open type bearing with riveted metallic outer ring piloted retainer, marked - "VKF- 2-LE-6306".

4. 936d - Single row, open type bearing with riveted metallic outer ring piloted retainer, marked - "VKF- 2-LE-6305-LR".

5. 936e - Single row, open type bearing with riveted steel ribbon ball retainer, marked - " 3-205".

6. 936f - Single row, open type bearing with riveted steel ribbon ball retainer, marked - " 3-205".

7. 936g - Single row, open type bearing with riveted steel ribbon ball retainer, marked - " 3-203".

The following will summarize the results of our findings:

I. Dimensions and Identification

A. 1. Bearing is of Conrad type non filling slot construction. The boundary dimensions are identical with the Fafnir 405K.

2. Bearing is of Conrad type non filling slot construction. The boundary dimensions are identical with the Fafnir 405K.

3. Bearing is of Conrad type non filling slot construction. The boundary dimensions are identical with the Fafnir 305K.

4. Bearing is of Conrad type non filling slot construction. The boundary dimensions are identical with the Fafnir 305K.

5. Bearing is of Conrad type non filling slot construction. The boundary dimensions are identical with the Fafnir 205K.

6. Bearing is of Conrad type non filling slot construction. The boundary dimensions are identical with the Fafnir 205K.

7. Bearing is of Conrad type non filling slot construction. The boundary dimensions are identical with the Fafnir 203K.

B. The bore, O.D. and width tolerances of the "205" and the "203" bearings can be compared to the ABEC-1 grade or standard commercial class of tolerances. Tolerances found on the "405" and "305" bearings have approximated ABEC-3 tolerances, which are closer than the ABEC-1 tolerances.

C. The lateral and radial eccentricity, squareness, and parallelism were found to be as follows, and are compared to the ABEC-1 and ABEC-3 tolerances for bearings having these boundary dimensions:

	Bearing 1		Bearing 2		Bearing 3		Bearing 4	
	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer
Parallel	.00025	.0004	.0001	.0017*	.0004	.0005	.0001	.00035
Square	.0003	.0004	.00035	.0007	.0001	.00015	.00005	.0002
Ecc. Rad.	.0004	.0002	.0004	.0002	.0003	.0004	.0003	.0004
Ecc. Lat.	.0009*	.0007	.0003	.0009	.00025	.00035	.00025	.0002

	Bearing 5		Bearing 6		Bearing 7	
	Inner	Outer	Inner	Outer	Inner	Outer
Parallel	.00015	.0014*	.0004	.00065	.00055	.00045
Square	.0002	.0003	.0001	.0003	.00015	.00005
Ecc. Rad.	.00025	.0002	.0001	.0001	.0002	.0007
Ecc. Lat.	.0002	.0006	.0003	.0005	.0005	.0013*

ABEC-1 Standards

	405K		305K		205K		203K	
	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer
Parallel	.0008	.0010	.0008	.0010	.0008	.0010	.0008	.0008
Square	.0008	.0010	.0008	.0010	.0008	.0010	.0008	.0008
Ecc. Rad.	.0005	.0010	.0005	.0010	.0005	.0010	.0004	.0008
Ecc. Lat.	.0008	.0012	.0008	.0012	.0008	.0012	.0008	.0012

ABEC-3 Standards

	405K		305K		205K		203K	
	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer
Parallel	.0004	.0006	.0004	.0006	.0004	.0006	.0004	.0004
Square	.0004	.0005	.0004	.0005	.0004	.0005	.0004	.0004
Ecc. Rad.	.0003	.0005	.0003	.0005	.0003	.0005	.0003	.0004
Ecc. Lat.	.0006	.0008	.0006	.0008	.0006	.0008	.0006	.0008

Although the bore, outside diameter, and width tolerances of the "405" and the "305" bearings can be compared to ABEC-3 tolerances, the running accuracies as indicated in parallelism, squareness, lateral and radial eccentricities have shown all except the "305" bearings to approximate the ABEC-1 or common commercial grade of tolerance. In several instances * these limits were exceeded.

The boundary dimensions and the running accuracies of both the "305" bearings however have been held within the ABEC-3 tolerance limits. Our conclusion from this is that these two "305" bearings do represent extra precision comparable to our ABEC-3 classification.

II. Internal Fit-Up

	Bearing 1	Bearing 2	Bearing 3	Bearing 4
Radial Play	.00045	.0006	.0005	.0006
End Shake	.006	.005	.0055	.005

	Bearing 5	Bearing 6	Bearing 7
Radial Play	.00035	.0003	.0006
End Shake	.0045	.0055	.005

The internal clearance of all bearings showed them to have an "R" or regular fit-up in comparison with Fafnir standards.

III. Anderometer Readings

The RMS values are expressed in anderons.

	Bearing 1	Bearing 2	Bearing 3	Bearing 4
Low Band	140	100	40	50
Medium Band	40	60	60	80
High Band	240	210	300	300

	Bearing 5	Bearing 6	Bearing 7
Low Band	80	65	70
Medium Band	80	35	100
High Band	260	180	150

See conclusions for comments on above values.

IV. Motor Spin Test for Sound

Bearing	Decibels	Comparison to Fafnir Std.
1	71 - 73	Poor
2	68 - 72	Poor

IV. Motor Spin Test for Sound (Continued)

Bearing	Decibels	Comparison to Fafnir Std.
3	64 - 68	Poor
4	68	Poor
5	52	Fair
6	40 - 42	Good
7	61 - 62	Poor

Conclusions:

The race quality of all bearings as determined by the anderometer readings is "poor" in comparison to Fafnir standards. Bearings #3, 4 which were held to the ABEC-3 class of tolerances on dimensions were found to have inferior race quality as evidenced by the high band. The high band frequency readings, which measure the amplitudes of radial displacement in the range from 60-300 irregularities per revolution, were considerably higher than our limits would allow for a bearing of ABEC-1 tolerances.

Bearings assembled with the steel ribbon ball retainers showed good riveting throughout and the retainer fits were good. Examination of the retainers of bearings 3, 4 showed that the retainers were not truly concentric with the outer ring, and that when spun on a 1/10 hp. motor at 1700 rpm., some heat was generated due to the friction between the retainer O.D. and the outer ring bore.

All bearings showed very wide radiuses on the bore of inner and the O.D. of the outer, which in effect has reduced the face widths and consequently the contacting surface which abut against the shaft and housing shoulders. The chamfers on the inner ring O.D. and outer ring bores in general were very crude.

Examination of grinding marks on the faces of bearings 1, 2, 3, 4 have indicated that a Norton or Gardner type machine was used. Ring faces of bearings 5, 6, 7 however are characteristic of a Blanchard type surface grinder.

All outer ring bores showed fairly good marking cuts and the O.D.'s of the inners are examples of a good "commercial" grind.

W. W. Gordon

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